

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 June 2001 (21.06.2001)

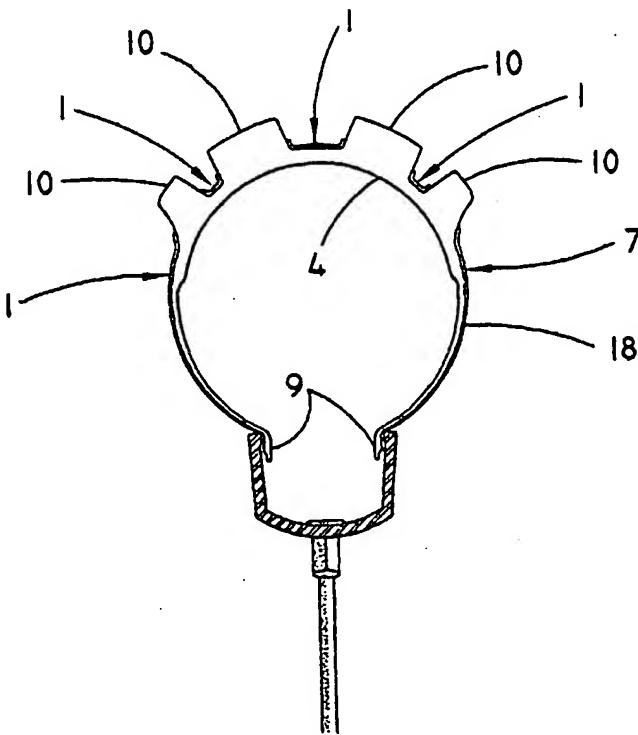
PCT

(10) International Publication Number
WO 01/43958 A1

- (51) International Patent Classification⁷: B29D 30/52,
B60C 1/00, 11/02, 123/00
- (21) International Application Number: PCT/US00/32784
- (22) International Filing Date: 4 December 2000 (04.12.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/171,232 16 December 1999 (16.12.1999) US
09/695,770 25 October 2000 (25.10.2000) US
- (71) Applicant: SWEETSKINZ, INC. [US/US]: 2309-11 Wallace Street, Philadelphia, PA 19130 (US).
- (72) Inventors: MELLET, Yann, J.: 2309-11 Wallace Street, Philadelphia, PA 19103 (US). MELLET, Therese:
- 2309-11 Wallace Street, Philadelphia, PA 19130 (US).
- (74) Agents: HAMEL, Kevin, R. et al.; Akin, Gump, Strauss, Hauer & Feld, L.L.P., One Commerce Square, 2005 Market Street, 22nd floor, Philadelphia, PA 19103-7986 (US).
- (81) Designated States (national): AE. AG. AL. AM. AT. AU. AZ. BA. BB. BG. BR. BY. BZ. CA. CH. CN. CR. CU. CZ. DE. DK. DM. DZ. EE. ES. FI. GB. GD. GE. GH. GM. HR. HU. ID. IL. IN. IS. JP. KE. KG. KP. KR. KZ. LC. LK. LR. LS. LT. LU. LV. MA. MD. MG. MK. MN. MW. MX. MZ. NO. NZ. PL. PT. RO. RU. SD. SE. SG. SI. SK. SL. TJ. TM. TR. TT. TZ. UA. UG. UZ. VN. YU. ZA. ZW.

[Continued on next page]

(54) Title: COVER MEMBER AND METHOD OF MAKING SAME



(57) Abstract: A cover (1) for a tire is disclosed. The tire (2) includes a base (4) with an outer circumferential surface and a tread pattern on the outer circumferential surface. The tread pattern includes a plurality of spaced tread members (10) extending radially outwardly from the outer circumferential surface. The cover (1) is a continuous loop for engagement with the outer circumferential surface between the tread members (10) and has a generally radially outwardly directed external surface. The cover (1) includes a plurality of openings (12) extending therethrough, whereby at least some of the tread members (10) are positioned within the openings. The cover (1) may include a decorative pattern (16).

WO 01/43958 A1



(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(48) Date of publication of this corrected version:
30 May 2002

(15) Information about Correction:
see PCT Gazette No. 22/2002 of 30 May 2002, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

5

TITLE OF THE INVENTION

Cover Member And Method Of Making Same

10

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on U.S. Provisional Application No.

60/171,232, filed December 16, 1999.

15

BACKGROUND OF THE INVENTION

The present invention relates generally to tire functional and aesthetic enhancement and, more particularly, to a cover which is applied to a tire.

20

BRIEF SUMMARY OF THE INVENTION

A cover for a tire. The tire includes a base with an outer circumferential surface and a tread pattern on the outer circumferential surface. The tread pattern includes a plurality of spaced tread members extending radially outwardly from the outer circumferential surface. The cover is a continuous loop for engagement with the outer circumferential surface between the tread members and has a generally radially outwardly directed external surface. The cover includes a plurality of openings extending therethrough, whereby at least some of the tread members are positioned within the openings.

25

BRIEF DESCRIPTION OF THE SEVERALS VIEW OF THE DRAWINGS

The following detailed description of preferred embodiments of the invention will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention there are shown in the drawings

embodiments which are presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentality shown. In the drawings:

Fig. 1 is a perspective view of a cover in accordance with a preferred embodiment of the present invention;

Fig. 2 is a perspective view of a portion of a bicycle tire showing the cover of Fig. 1 applied to a bicycle tire;

Fig. 3 is a fragmentary top plan view of a cover in accordance with a first alternative embodiment of the present invention;

Fig. 4 is a fragmentary top plan view of a portion of a standard bicycle tire;

Fig. 5 is a fragmentary sectional view of a rim-mounted bicycle tire illustrating the initial stage of application of the cover member of Fig. 3;

Fig. 6 is a view similar to Fig. 5 with the cover completely applied to the tire;

Fig. 7 is a top plan view of a segment-type cover in accordance with a second alternative embodiment of the present invention;

Fig. 8 is a sectional view of the cover of Fig. 7 taken along the section line 8-8 of Fig. 7; and

Fig. 9 is a fragmentary sectional view of a rim-mounted bicycle tire illustrating a third alternative embodiment of the cover of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

25

The present invention relates to a cover 1 which is adapted to be installed or applied on a tire. In the present embodiment, a standard or specialty bicycle tire 2 is shown to illustrate the invention. Figs. 2, 4, and 5 show a tire 2, such as a standard bicycle tire. It should be understood, however, that the cover 1 could be applied to any type of tire, if desired. The cover 1 performs the functions of both enhancing the performance characteristics of a tire and providing increased safety and

visual interest of a tire.

As best shown in Fig. 5, the tire 2 (shown in radial cross-section) has a base 4 with an outer circumferential surface 6, a pair of side walls 8, a pair of beads 9, and a tread pattern on the outer circumferential surface 6. The tread pattern includes a plurality of spaced tread members 10, which extend radially outwardly from the outer circumferential surface 6 of the base 4. The tread pattern for a particular tire will vary depending upon the style and type of tire.

As shown in Figs. 1-3 and 5-8, the present invention comprises a cover 1, which is adapted to be installed upon or applied to a tire 2. In a preferred embodiment, best shown in Fig. 1, the cover 1 is a continuous loop and preferably is mated with the tire 2 during the manufacturing process. In a first alternative embodiment, best shown in Fig. 3, the cover 1 generally is an elongated strip and of substantially the same length as the circumferential dimension of the outer circumferential surface 6 of the base 4. However, the cover 1 could have a length which is greater than or less than the circumference of the tire 2, if desired. For example, in a second alternative embodiment, the cover 1 comprises one or more short segments, as shown in Fig. 7, which are installed on the tire 2 at spaced locations around the outer circumferential surface 6. The length will be determined by the functional and aesthetic characteristics one wishes to impart on the tire 2 through use of the cover 1. For example, the cover 1 of the preferred embodiment, wherein the cover 1 is a continuous loop as shown in Fig. 1, enhances functional and aesthetic characteristics of the tire 2 around the entire circumference of the tire 2. In contrast, the cover 1 of the second alternative embodiment, wherein the cover 1 is a short segment as shown in Fig. 7, enhances functional characteristics only in the region of the cover 1, but may improve the aesthetic functionality of the tire 2 in its entirety.

The cover 1 of the preferred embodiment preferably has a width that encompasses the entire width of the tread pattern and a portion of each sidewall 8. It is contemplated, however, that the width of the cover 1 may be less than that of the entire width of the tread pattern plus a portion of each sidewall 8. For example, the cover 1 could be configured to overlie at least a portion of only one of the sidewalls 8 of the

tire 2. Preferably, the cover 1 engages at least a portion of the outer circumferential surface 6 between the tread members 10 of the tread pattern. The width of the cover 1 will depend on a number of factors. If the primary function of the cover 1 is decorative, the width of the cover 1 and the portions of the tire 2 on which the cover is applied will be determined by the visual effect to be created. The decorative function of the cover 1 will be discussed more fully below. If the primary purpose of the cover is functional, relating to improved surface adhesion, puncture resistance, cut resistance, wear resistance, mud shedding, etc., the width and coverage will be determined by the area of the tire 2 to which improved functionality is needed.

10 Additional factors to be considered in determining the length and width of the cover 1 are the added weight and cost of the cover 1. Inasmuch as rotational weight, particularly at the outer circumference of a tire, dramatically increases the amount of power required to increase the rotational speed of the tire, minimizing this rotational weight is critical to overall tire performance. Accordingly, the cover 1 must be carefully tailored to the functional and aesthetic purposes sought to be achieved.

15 Whereas in the preferred embodiment, the cover 1 is intended to enhance the functional and aesthetic characteristics of the tire 2 around the entire circumference of the tire 2, one may desire that these functional and/or aesthetic characteristics be more locally limited on the outer circumferential surface of the tire 2 and thereby opt for the configuration of the first or second alternative embodiments, or other combinations of

20 length and width, all of which are contemplated as being within the scope of the present invention.

25 As best shown in Figs. 1, 3, and 7, the cover 1 preferably has a plurality of openings 12 extending therethrough, whereby at least some of the tread members 10 extend through the openings 12. Preferably, each opening 12 through the cover 1 corresponds generally in size and shape to a single tread member 10. It is contemplated that the size and shape of an opening 12 need not correspond to the size and shape of a single tread member 10, but could correspond to more than one tread member 10, or could generally correspond to one or more tread members 10 such that the outer periphery of the opening 12 does not precisely fit the tread member(s) 10.

The cover 1 can, therefore, be matched to any particular tread pattern to enhance the functional and aesthetic characteristics of virtually any tire 2.

In a third alternative embodiment, shown in Fig. 9, the openings 12 are sized and configured such that the cover 1 extends generally radially outwardly from the base 4 along the sides of the tread members 10. In other words, the cover 1 extends from the base 4 to embrace at least a portion of the sides of the tread members 10. The cover 1 may extend the entire length of the tread members 10, or may extend only a portion of the length of the tread members 10 as shown in Fig. 9. By permitting the cover 1 to extend radially outwardly from the base 4 to embrace the sides of the tread members 10, the cover 1 can provide not only additional aesthetic characteristics, but can greatly improve the strength and durability of the tire at one of its weakest points. Those skilled in the art will recognize that the interface between the base 4 and tread members 10 is subjected to great shear and tension forces and, therefore, is prone to failure. By permitting the cover 1 to extend over this interface and radially outwardly along the sides of the tread members 10, much of the shear and tension forces will be borne by the cover 1, thereby increasing the life of the tire 2. It should be recognized that the cover 1 may, but need not, extend radially outwardly along the sides of all the tread members 10. The cover 1 may extend radially outwardly along the sides of only a portion of the total number of tread members 10.

Preferably, the cover 1 is made of a high strength resin based material consisting of Kevlar or other high strength fiber such as nylon set in resin. The high-strength fiber may take many forms, including woven, filament, pulp, staple, etc. Alternatively, the cover 1 can be made of rubber, preferably a blend of about fifty percent styrene-butadiene rubber and fifty percent natural rubber. Additionally, a combination of rubber and a polymeric material could be used. Other materials could be used if desired. The material(s) selected must provide both durability and light weight to the cover 1. For example, films and engineered polymers can be used to meet these criteria. One such example is Mylar, available from E.I. du Pont de Nemours and Co., Wilmington, DE, which provides the necessary mechanical properties. It is also contemplated that the cover 1 be coated with a protective covering

(not shown) to protect the cover from the effects of wear and abrasion. Preferably the protective coating is urethane, but it is contemplated that the protective coating could be any clear, durable, flexible material with sufficient bonding characteristics to adhere to the tire 2 under the conditions of anticipated use. Preferably, the protective coating selected also provides protection to the cover 1 from ultraviolet light and the like.

As best shown in Figs. 1 and 2, the cover 1 preferably includes a decorative pattern 16 which may be a pattern incorporating the trade dress of a particular bicycle manufacturer (not shown) or a snake skin pattern (not shown), as examples. The decorative pattern 16 can consist of virtually any pattern or simply one or more solid colors. To enhance the safety and aesthetic characteristics of the tire 2, the decorative pattern 16 may include a phosphorescent material 17, as shown in Fig. 2, applied in a pattern such as stripes as shown in Fig. 2, or as a solid color as shown in Fig. 1. The decorative pattern 16 may also include reflective particles (not shown) to enhance the visual and safety aspects of the tire 2. It should be understood that the decorative pattern 16 can be incorporated in the cover 1 itself, or in the protective coating (not shown), or both. The decorative pattern 16 could also include specifically directed advertising related or unrelated to the tire 2, bicycle (not shown) or the like. The decorative pattern 16 may consist of a plurality of discrete decorative patterns 16a, 16b, as shown in Figs. 1 and 2. The decorative pattern 16 need not be distributed over the entire cover 1, but may be distributed over only a portion of the cover 1. For example, a portion of the decorative pattern 16 could be located on the portion of the cover 1 that overlies the sidewalls 8 of the tire 2.

The decorative pattern 16 is visible on at least a portion of the external surface of the cover 1, i.e., it is applied to the surface of the cover or is embedded within the cover. Preferably, the cover 1 is produced with the intended colored design embedded within the resin-based compound so that the pattern will not wear off during use. Alternatively, the decorative pattern 16 could be applied to the external surface 18 of the cover 1 as with a dye, for example, or printed on a woven fabric. It will be understood by those skilled in the art from reading this disclosure that a resin material that is at least substantially transparent must be used for the decorative pattern 16 to be

visible if embedded within the resin material of the cover 1 of the preferred embodiment.

As shown in Figs. 3 and 7, the external surface 18 of the cover 1 preferably includes a surface texture 20 for improving adhesion between the cover 1 and the trail and/or road surface(s). The primary effect of the surface texture 20, which will lie within the interstitial region between the openings 12, is to enhance the ability of the cover 1 to grip the trail and/or road surfaces, to shed mud, or to channel water away from the tire 2. The surface texture 20 may encompass the entire external surface 18 of the cover 1, or may encompass only a portion of the external surface 18 of the cover 1, the remainder of the cover 1 having no appreciable texture. As shown in Figs. 3 and 7, the surface texture 20 may include a plurality of different textures 20a, 20b, or the surface texture 20 may encompass only a single texture (not shown). The surface texture 20 may be made up of virtually any combination of bumps, knobs, depressions, ridges, etc. that will provide a gripping, mud shedding, or water channeling characteristic to the cover 1. As will be recognized by those skilled in the art that the surface texture 20 may also serve to enhance the aesthetic characteristics of the tire 2.

The cover 1 preferably is constructed by die cutting in accordance with the tread pattern of the tire 2. In the preferred embodiment, wherein the cover 1 extends around the outer circumference of the tire 2, the cover 1 is formed from a flat sheet of material (not shown) and a series of triangular-shaped cuts are removed from the cover 1 along its lateral edges such that the cover 1 will overlie the tire 2 in a form-fitting arrangement. As those skilled in the art will recognize, the size, number, and shape of the triangular cuts will vary depending on the size of the cover 1 and the size and shape of the tire 2. In the standard mountain bike tire 2 shown in the accompanying figures, approximately ninety triangular cuts are preferred to provide a fit which appears upon application to be nearly seamless. The cover 1 may be applied to the tire 2 using any one of several methods. In the preferred embodiment, shown in Fig. 1, the cover 1 is a continuous loop which is applied to the tire 2 during manufacture of the tire 2, by application to the green tire prior to molding in a tire mold (not shown). Alternatively, the cover 1 of the preferred embodiment may be applied to

the tire 2 prior to inflation of the tire 2, the inflation expanding the tire 2 into the cover 1 (which in the preferred embodiment is a continuous loop) and thereby securing the cover 1. Using this method, adhesive can also be used to further secure the cover 1 to the tire 2, as described below. In the first and second alternative embodiments,
5 wherein the cover 1 is noncontinuous, the cover 1 may be applied to a green tire, as described above, or may be bonded to the tire 2 using an adhesive, as shown in Fig. 5. Preferably the adhesive 14 used is a pressure sensitive adhesive (PSA), the preferred PSA being 3M Adhesive Tape 468MP applied with 3M Prime 94, both available from 10 3M Corporation, St. Paul, MN. An alternative PSA is 3M 6035, also available from 3M Corporation. Alternatives to PSA's are liquid adhesives and hot melt curable adhesives, and other adhesives that will provide a bond between the cover 1 and tire 2 that is at least substantially permanent.

It will be appreciated by those skilled in the art that changes could be made to the embodiment described above without departing from the broad inventive concepts thereof. It should also be understood that the above description was directed to a bicycle tire 2 for purposes of providing one example of the types of tires to which the present invention may be applied. It is clearly contemplated that the present invention may be applied to any type of tire, including, but not limited to, all types of bicycle tires including sew-ups, tubeless and clincher tires, in addition to motorcycle 15 tires, automobile tires, heavy equipment tires, etc. It is understood, therefore, that this invention is not limited to the particular embodiment disclosed, but is intended to cover 20 all modifications within the scope and spirit of the invention.

CLAIMS

We claim:

1. A cover for a tire, the tire having a base with an outer circumferential surface and a tread pattern on the outer circumferential surface, the tread pattern including a plurality of spaced tread members extending radially outwardly from the outer circumferential surface, the cover being a continuous loop for engagement with the outer circumferential surface between the tread members and having a generally radially outwardly directed external surface, the cover having a plurality of openings extending therethrough, whereby at least some of the tread members are positioned within the openings.
2. The cover of claim 1, further comprising a decorative pattern visible on at least a portion of the external surface of the cover.
3. The cover of claim 2 wherein the decorative pattern is embedded within the cover.
4. The cover of claim 2 wherein the decorative pattern includes a phosphorescent material.
5. The cover of claim 1, further comprising a surface texture on at least a portion of the external surface of the cover.
6. The cover of claim 1 wherein the tread members have sides, the cover extending generally radially outwardly from the base along the sides of the at least some of the tread members.
7. The cover of claim 1 wherein each opening corresponds in size and shape to a single tread member.

8. The cover of claim 1 wherein the tire includes a pair of sidewalls, the cover having a width that encompasses at least a portion of at least one of the sidewalls of the tire.

5

9. The cover of claim 1 wherein the cover includes a high-strength fiber.

10. The cover of claim 1 wherein the cover further includes an adhesive backing for adhering the cover to the base of the tire.

10

11. The cover of claim 10 wherein the adhesive backing is pressure sensitive adhesive.

12. A cover for a tire, the tire having a base with an outer circumferential surface and a tread pattern on the outer circumferential surface, the tread pattern including a plurality of spaced tread members extending radially outwardly from the outer circumferential surface, the cover for engagement with the outer circumferential surface between the tread members and having a generally radially outwardly directed external surface, the cover including at least one cover segment having a plurality of openings extending therethrough, whereby at least some of the tread members are positioned within the openings.

25

13. The cover of claim 12 further comprising a decorative pattern visible on at least a portion of the external surface of the cover.

14. The cover of claim 13 wherein the decorative pattern is embedded within the cover.

15. The cover of claim 13 wherein the decorative pattern includes a phosphorescent material.

16. The cover of claim 12 further comprising a surface texture on at least a portion of the external surface of the cover.

5 17. The cover of claim 12 wherein the tread members have sides, the cover extending generally radially outwardly from the base along the sides of the at least some of the tread members.

10 18. The cover of claim 12 wherein each opening corresponds in size and shape to a single tread member.

19. The cover of claim 12 wherein the tire includes a pair of sidewalls, the cover having a width that encompasses at least a portion of at least one of the sidewalls of the tire.

15 20. The cover of claim 12 wherein the cover includes a high-strength fiber.

21. The cover of claim 12 wherein the cover further includes an adhesive backing for adhering the cover to the base of the tire.

20 22. The cover of claim 21 wherein the adhesive backing is pressure sensitive adhesive.

25 23. A tire having a cover, the tire having a base with an outer circumferential surface and a tread pattern on the outer circumferential surface, the tread pattern including a plurality of spaced tread members extending radially outwardly from the outer circumferential surface, the cover engaging at least a portion of the outer circumferential surface between the tread members and having a generally radially outwardly directed external surface, the cover having a plurality of openings extending therethrough, whereby at least some of the tread members are positioned

within the openings.

24. The tire of claim 23 wherein the cover is a continuous loop.

5 25. The tire of claim 23 wherein the cover is noncontinuous.

26. The tire of claim 23 wherein the tread members have sides, the cover extending generally radially outwardly from the base along the sides of the at least some of the tread members.

10 27. The tire of claim 25 wherein the cover includes a plurality of segments, each segment having at least one opening therethrough, the opening corresponding to at least one tread member which extends through the opening.

15 28. The tire of claim 23 wherein the cover further comprises a decorative pattern.

29. The tire of claim 28 wherein the decorative pattern includes a phosphorescent material.

20 30. The tire of claim 1 wherein the cover further comprises a surface texture.

25 31. A method for making a decorative tire, the tire having a base with an outer circumferential surface and a tread pattern on the outer circumferential surface, the tread pattern including a plurality of spaced tread members extending radially outwardly from the outer circumferential surface, the method comprising the steps of:

30 forming a cover from an elongated strip;
cutting a plurality of openings through the elongated strip, the openings corresponding to at least some of the tread members; and

applying the cover to engage the outer circumferential surface of the tire such that at least some of the tread members pass through the openings.

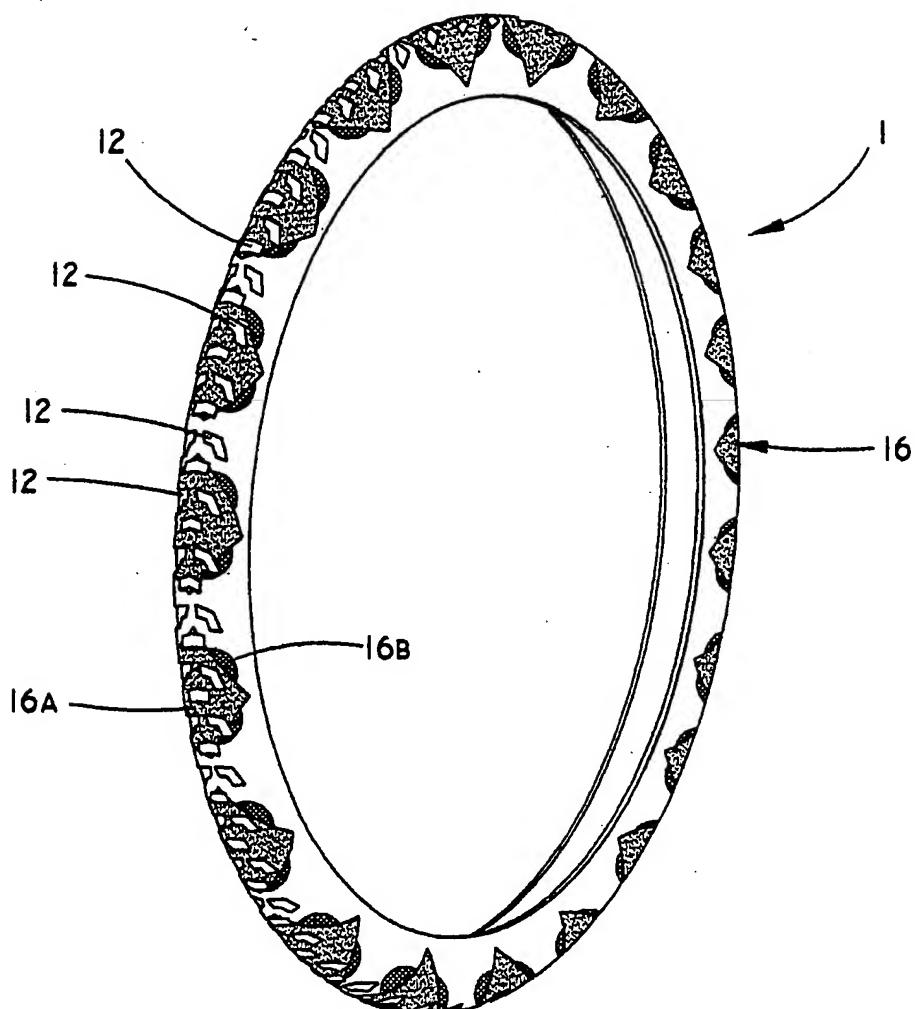


FIG. I

1/6

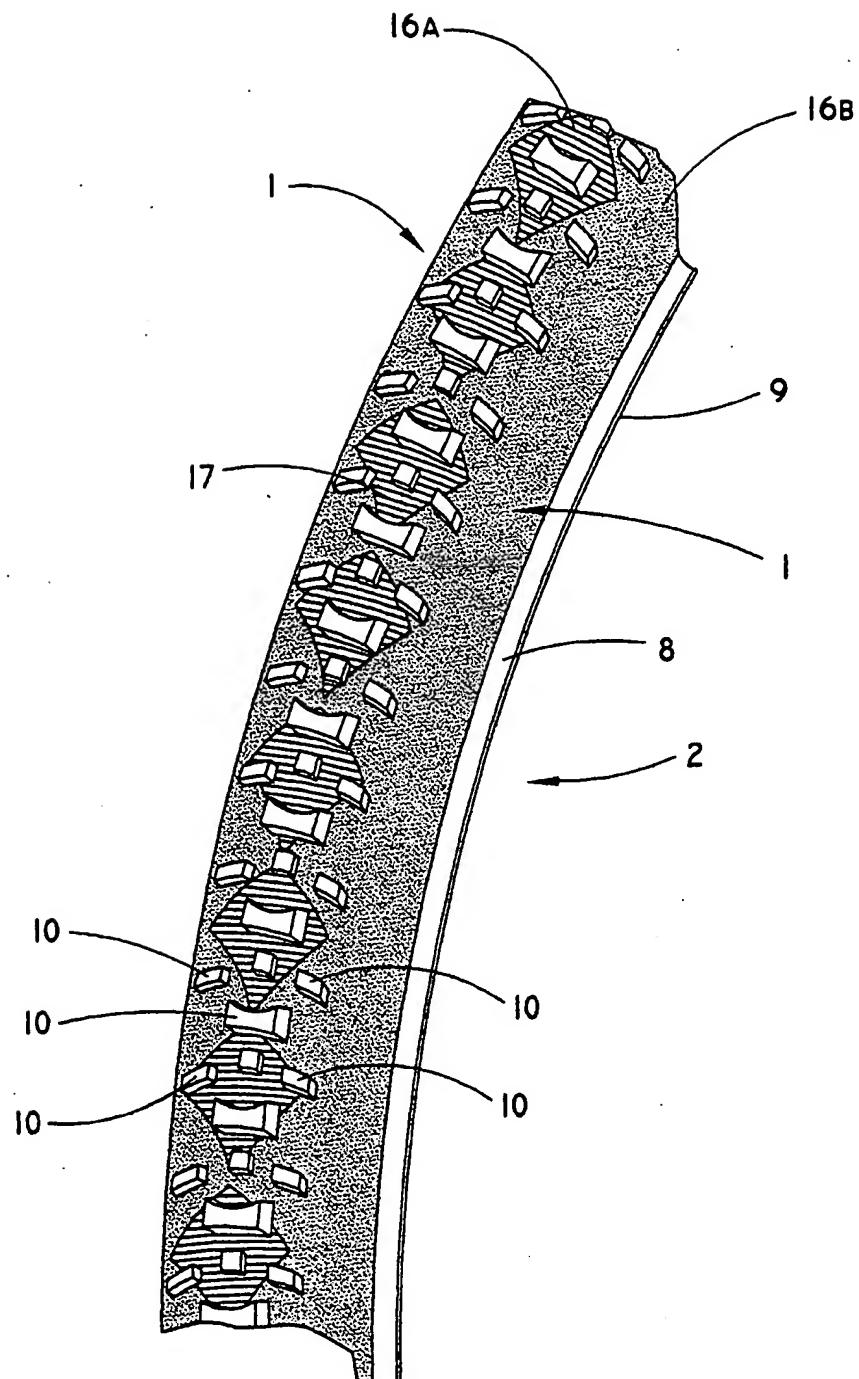


FIG. 2
2/6

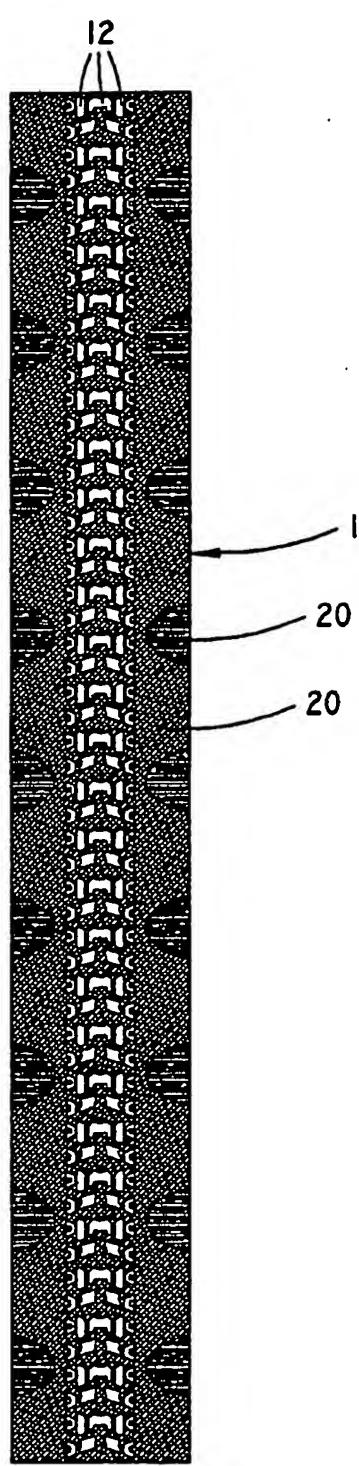


FIG. 3

3/6

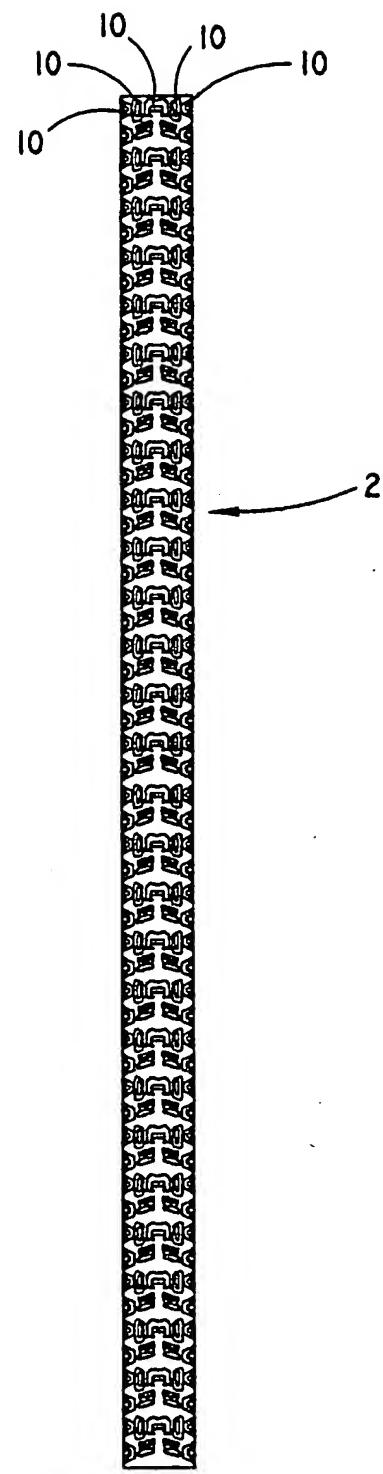


FIG. 4

3/6

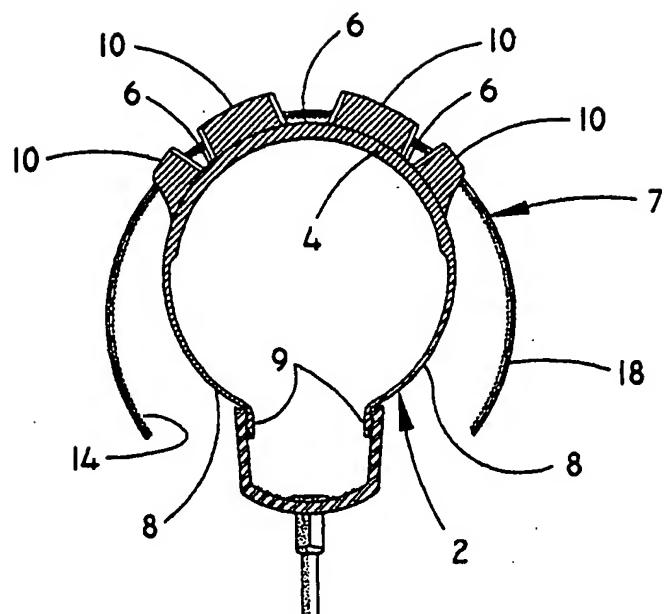


FIG. 5

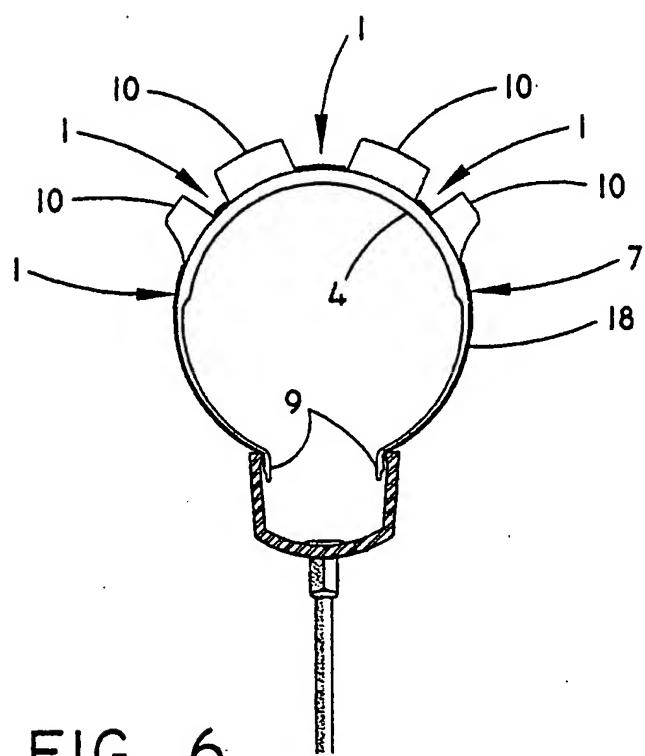


FIG. 6

4/6

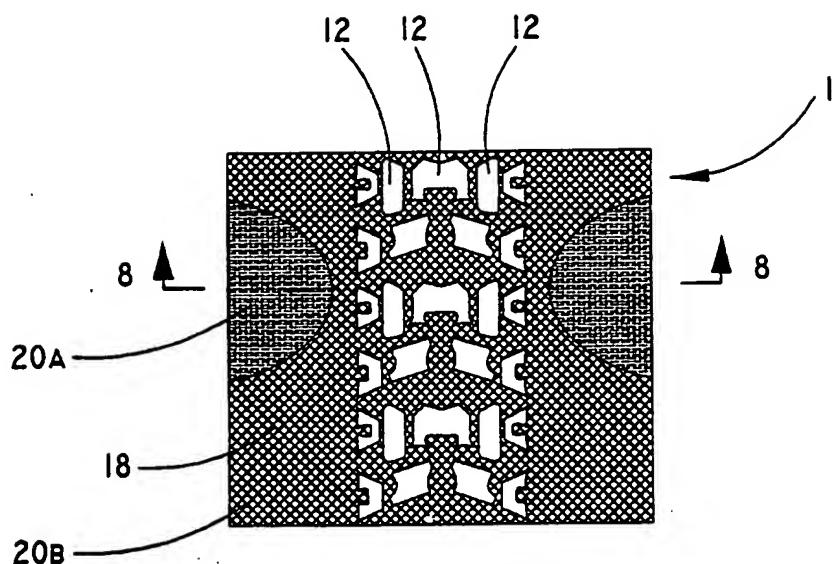


FIG. 7

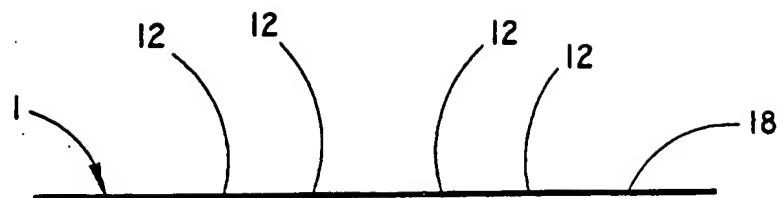


FIG. 8

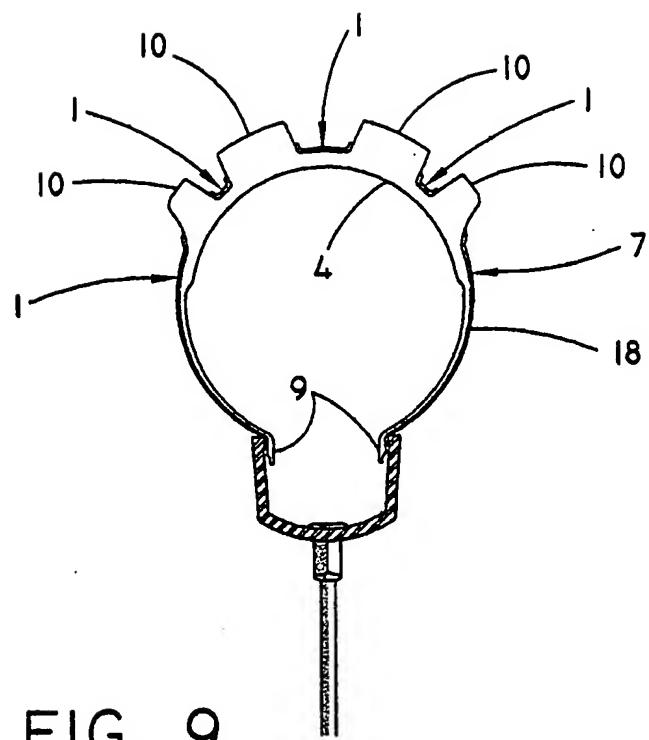


FIG. 9

6/6

INTERNATIONAL SEARCH REPORT

International application No. PCT/US00/32784

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B29D 30/52; B60C 1/00, 11/02, 123/00
US CL :152/176, 179, 188, 191, 209.5, 209.11, 209.19; 156/128.6

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 152/154.2, 169, 173, 175, 176, 178, 179, 185, 187, 188, 190, 191, 209.5, 209.11, 209.19, DIG.12; 156/128.1, 128.6, 129

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST
search terms: tire, color, tread, cover, protector

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,614,041 A (DUMKE ET AL) 25 March 1997 (25.03.97), col. 1 lines 54-67, col. 2 lines 1-27.	6, 9, 17, 20, 26
X	US 4,815,513 A (HIRAKAWA) 28 March 1989 (28.03.89), col. 5 lines 33-36, col. 6 lines 58-60.	1, 5-7, 9, 23-24, 30
A	US 3,833,040 A (BINS) 03 September 1974 (03.09.74), abstract.	1-31
A	US 3,770,040 A (DECICCO) 06 November 1973 (06.11.73), abstract.	1-31
Y	US 2,272,891 A (COBEN) 10 February 1942 (10.02.42), page 1 left column lines 34-51, right column lines 22-26.	1-31

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 11 FEBRUARY 2001	Date of mailing of the international search report 04 APR 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer  STEVEN D. MAKI Telephone No. (703) 308-0661

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/32784

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1,311,750 A (BRASHEAR) 29 July 1919 (29.07.19), page 1 lines 74-112, page 2 lines 1-7.	1, 7, 9 -----
--		
Y		31
X	US 822307 A (SCARBOROUGH ET AL) 05 June 1906 (05.06.06), page 1 lines 8-53.	1, 6-8, 23-24, 26
Y	JP 11-151908 A (AMINO ET AL) 08 June 1999 (08.06.99), abstract.	2-4, 13-15, 28-29
Y	JP 08-318715 A (SASAKI) 03 December 1996 (03.12.96), abstract.	2-4, 13-15, 28-29
Y	JP 06-99705 A (KOUJIROU) 12 April 1994 (12.04.94), abstract.	5, 16, 30
Y	JP 03-54004 A (WATANABE ET AL) 08 March 1991 (08.03.91), abstract.	2-4, 13-15, 28-29
Y	JP 61-146605 A (HAYAKAWA) 04 July 1986 (04.07.86), abstract.	2-4, 13-15, 28-29
Y	EP 667251 A1 (PFEIFFER) 16 August 1995 (16.08.95), abstract.	5, 16, 30
Y	DE 9102607 U1 (BRUCKL) 25 July 1991 (25.07.91), figures 1-8.	1-31
Y	CA 547958 A (DOWNEY) 29 October 1957 (29.10.57), column 2 lines 19-35.	12-22
X	AT 136525 A (KURZ) 15 September 1933 (15.09.33), figures -17.	1, 5, 7
X	FR 560285 A (MONGE) 02 October 1923 (02.10.23), figures 1-4.	1, 6-8, 23-24, 26,
--		31 -----
Y		2-5, 9-22, 25, 27-30
X	GB 184107 A (CUMMING) 10 August 1922 (10.08.22), page 1 lines 48-84.	1, 6-8, 23-24 -----
--		2-5, 9-22, 27-31
Y		

Form PCT/ISA/210 (continuation of second sheet) (July 1998)*